Chapter 2

CHAPTER 2. AFFECTED ENVIRONMENT

2.1 Facilities

Fort Wainwright has 13,500 acres of built-up area, including the small arms complex (Johnston 1988). The Main Post has 771 buildings with a total of 8,850,876 square feet (Hill undated). It contains 818,710 acres of maneuver land and 65,964 acres of impact areas (Johnston 1988). The installation has three major training facilities: close-in training areas, Yukon Training Area (YTA), and Tanana Flats Training Area (TFTA) (Figure 2-1).

2.1.1 Range Facilities

All areas outside of urban areas are defined as range facilities. Range facilities can be further broken down as follows:

- Firing Ranges
- Impact Areas
- Training Areas
- Drop Zones / Landing Zones
- Artillery Firing Points

United States Army Alaska Regulation 350-2 lists the Fort Wainwright small arms and crew-served ranges. The post has 14 firing ranges and two demolition ranges, one at Range Control and one on YTA, that are similar to impact areas. Twenty-six mortar and artillery firing points (listed as a single range) that use Alpha Impact Area at TFTA and Stuart Creek Impact Area on YTA are also included.

Hangar 6 is one of the many Ladd Field National Historic Landmark facilities actively used at Fort Wainwright.

2.1.1.1 Firing Ranges

Live-fire training facilities include:

- **Record Range** used for M-16 qualification.
- **Combat Pistol Range** with seven lanes for all-caliber pistols with computer-scored Remote Electronic Target Sensing (RETS) targets at 13, 17, 19, 23, 27, and 31 meters.
- **Multi-purpose Machine Gun Range** with six lanes for Transition and Field Fire with computer-scored RETS targets from 100 to 1000 meters.
- **Known Distance Range** with 30 firing and zeroing points available at 25, 100/200, 300/400, and 500/600 meters, and 55 firing points on a 1000-inch zero range.
- **Hand Grenade (Familiarization) Range** with an unprotected ready line and two throwing bays.
- **Hand Grenade (Qualification) Range** with distance, accuracy, assault, and qualification courses.
- **40mm Grenade Range** with four firing points and four zero points available for practice and high explosives.
- **AT4/LAW/Viper Range** consisting of three firing points with hard targets, ranging from 75 to 350 meters, and one moving target.
- **MK-19 Range** with two lanes of stationary targets at 400-1500 meters, each lane with two dismounted and one mounted firing position.
- **Birch Hill Biathlon Range** is a 10-point stationary target range equipped with a warm-up building for training in arctic combat.

In 1996, the M-16 Qualification Range was converted to a RETS range and expanded from 10 to 16 firing lanes. This was the last major range construction project completed on Fort Wainwright. Other training facilities include the Russian Trench System for small unit tactical trench system live-fire exercises, numerous mortar and artillery firing points, and an aerial gunnery range. An expansion of the current Birch Hill Biathlon Range is proposed to allow for joint use by military and non-military personnel.

2.1.1.2 Other Range Facilities

USARAK Regulation 350-2 lists Fort Wainwright training facilities where live fire is not practiced. These facilities include:

- Four drop zones (one with a landing strip)
- Rappel tower
- Obstacle course
- Nuclear, Biological, and Chemical (NBC) facility
- Trench system
- Military Operations in Urban Training (MOUT) site
- Husky Drop Zone to support strategic airborne operations
- Clear Creek Assault Strip to support strategic airborne and battalion-sized operations

2.1.2 Transportation System

Fairbanks is a transportation center for much of central, northern, and northwestern Alaska. There are 841 miles of paved highways and over 1,000 miles of unpaved highways in and around Fairbanks. The George Parks, Steese, and Richardson highways bisect the area. The Parks Highway links Fort Richardson to Fort Wainwright, and the Richardson Highway links Fort Greely to Fort

Figure 2-1. Fort Wainwright Facilities.

See FWA INRMP Maps\FWA INRMP FIG02-01.PDF.

Figure 2-2. Fort Wainwright Transportation System.

See FWA INRMP Maps\FWA INRMP FIG02-02.PDF.

Wainwright. The Richardson Highway also connects Alaska with the Canadian road system via the Alcan Highway (Figure 2-2).

The Alaska Railroad provides rail service to Fort Wainwright. Alaska Railroad's main line passes through the Main Post, with spur tracks serving the central heating and power plant and warehouse circle. The track also connects with the Fairbanks industrial spur. The Alaska Railroad provides seasonal passenger and year-round freight and vehicle service between Anchorage and Fairbanks. Most northbound freight arrives by sea at the port of Anchorage for transfer to the railroad. The port of Anchorage has intermodal capability.

Wainwright Army Airfield and Eielson Air Force Base, about 17 miles south of Fort Wainwright, can support any type of military aircraft including Galaxy C5s. In addition, Allen Army Airfield at Fort Greely can support C5/C141 aircraft in the winter and C130 and C-117 II aircraft at all other times.

Fairbanks International Airport, five miles west of Fort Wainwright, is the nearest commercial airport. It is one of two international airports in Alaska and is served by several U.S. and international passenger and cargo airlines.

2.1.3 Water Supply

As of February 1996, Fort Wainwright had nine main drinking wells, two of which were active (Buildings 3559-1A and 3559-2B). In addition, there are drinking water wells for individual buildings. Water use on Fort Wainwright varies from 1.5 million gallons per day in winter to 2.0-2.5 million gallons per day in summer.

2.1.4 Projected Changes in Facilities

Changes in facilities that would affect natural resources will be determined by changes in the military mission. If Fort Wainwright were to be tasked with alternate missions, additional ranges could possibly be needed. Such new missions have not been identified. Facility development that would likely affect natural resources include new ranges, impact and target areas, and buildings in areas that are now undisturbed. All would require completion of appropriate national Environmental Policy Act (NEPA) documentation.

The draft Range and Training Land Program Development Plan (RTLP) has identified two ranges needed at Fort Wainwright to support the current mission and fulfill training requirements. A Multi-Purpose Range Complex, Light (MPRC-L) facility with the appropriate designation is needed to perform CALFEX (Combined Arms Fire and Exchange) operations. A MOUT CTF (Military Operations in Urban Terrain) would replace the existing facility, which was not built in accordance with military training standards.

2.2 Physical Resources

2.2.1 Topography

Fort Wainwright lies north of the Alaska Range, within the drainage of the Tanana River. The Main Post and TFTA lie within the Tanana-Kuskokwim Lowland. This depression was subsiding as the Alaska Range was rising to the south, and filling with sediments from those mountains. The area is bounded by uplands to the north, the Alaska Range to the south, and consists of alluvial fans extending northward from the mountains. The Tanana River flows along the northern edge of the lowland. The terrain is generally flat lowland, ranging from 128 to 512 feet above sea level (Nakata Planning Group 1987). Elevation gradients range from 40 to 50 feet/mile along upper portions of fans, to 6 to 7 feet/mile in the Tanana Flats (Racine et al. 1990).

YTA lies within the Yukon-Tanana Uplands, which consists of rounded, even-topped ridges with

Yukon Training Area contains varied and rugged terrain.

gentle side slopes, broad divides, flat-topped spurs, and gently sloping plains. Ridges occupy nearly 10% of the area, oriented in a northeast-southwest direction (Bonito 1980). Elevations range from 192 to 3,285 feet. Figure 2-3 shows topography of Fort Wainwright.

2.2.2 Geology

Central Alaska has not been glaciated, but during glacial advances, glaciers surrounded the area. Climatic fluctuations during the Quaternary Period caused glacial expansion and recession (Racine and Walters, 1991). Rivers flowing from glaciers deposited several hundred feet of silt, sand, and gravel in the Tanana and Yukon valleys. Most of the area is covered by a layer of loess ranging from several inches to more than 128 feet thick. Gravel deposits along the Tanana River are up to 154 feet thick and are a significant source of groundwater (Nakata Planning Group 1987).

Bedrock of the Yukon-Tanana Uplands, including most of YTA, is characterized by a complex assemblage of Precambrian and Paleozoic-age metamorphic rocks of the Yukon-Tanana crystalline complex (formerly known as the Birch Creek schist). These rocks were later intruded by Cretaceous and Tertiary-age igneous rocks, resulting in a few exposed areas of granite and quartz diorite. Silty micaceous loess, derived from outwash plains south of the Tanana River, was deposited over most of the area during the Pleistocene and Holocene. Some areas are covered by Quaternary deposits, with the most recent deposits occurring along stream valleys in the form of well-stratified gravel, sand, and silt (BLM and U.S. Army 1994). Figure 2-4 shows the geology of Fort Wainwright.

2.2.2.1 Seismicity

Fort Wainwright is in the Salcha seismic zone, a distinct northeast-trending band of epicenters about 50 kilometers long (Page et al. 1991; Alaska Earthquake Information Center and U.S. Geological Survey 1997). Although the epicenters form a conspicuous pattern, no associated fault movement has been identified (Page et al. 1991). The Salcha earthquake of 1937 was one of the largest ever recorded in the Interior, with a magnitude of 7.3. Its epicenter was less than 10 miles from the southwest corner of YTA. In 1996, an earthquake with a magnitude of 4.2 occurred on YTA east of Eielson AFB (U.S. Geological Survey National Earthquake Information Center 1998; Alaska Earthquake Information Center 1998). Many smaller earthquakes are routinely detected.

Earthquakes to the west of YTA in TFTA are associated with the Fairbanks seismic zone, another northeast-trending band of activity. An average of five or six earthquakes a year are actually felt in this zone, and swarms of micro-earthquakes occur (Page et al. 1991). In 1967, a series of three earthquakes of about magnitude 6 had epicenters to the west of YTA. Two other moderate (magnitude 4.0-4.6) quakes occurred in this zone in 1997 (U.S. Geological Survey National Earthquake Information Center 1998; Alaska Earthquake Information Center 1998).

2.2.2.2 Petroleum and Minerals

Mineral resources management on YTA and TFTA on Fort Wainwright is the responsibility of the BLM. YTA is exempt from provisions of the Mining Law of 1872, the Mineral Leasing Act of 1920 as amended, the Mineral Leasing Act for Acquired Lands of 1947, and the Geothermal Steam Act of 1970. The withdrawal is closed to all forms of mineral material disposal, both sale and free use, other than that which supports military activity (BLM and U.S. Army 1994).

Measures to safeguard resource values outlined in 43 CFR 3100, 43 CFR 3600, and 43 CFR 3809 apply to mineral development on withdrawn lands. Under terms of the Defense Appropriations Act of 2000, should withdrawn lands be opened to mineral location, mineral patents could convey title to locatable minerals only. These patents would also carry the right to use as much of the surface as necessary for mining under guidelines established by the Secretary of the Interior by regulation (BLM and U.S. Army 1994).

YTA has a low potential for oil or gas deposits, and no known potential for coal and oil shale. YTA has no potential for concentrations of phosphate, sodium, potassium, or gilsonite, and moderate potential for geothermal resources (BLM and U.S. Army 1994).

Figure 2-3. Fort Wainwright Terrain.

See FWA INRMP Maps\FWA INRMP FIG02-03.PDF.

Figure 2-4. Fort Wainwright Surface Geology.

See FWA INRMP Maps\FWA INRMP FIG02-04.PDF.

There has never been significant mining activity on YTA, and the area has been closed to mineral exploration since the 1950s. Placer mining has occurred south and east of YTA, and portions of YTA have a moderate to high potential for gold and tin deposits (Center for Ecological Management of Military Lands 1998). Historic placer mines are reported on Beaver Creek and Pine Creek. Records from the state of Alaska show a claim staked on a tributary of French Creek in the southwestern part of YTA. No valid claims exist now.

The *Proposed YTA Resources Management Plan Final EIS* prohibits mining in drop zones and landing fields, and within one mile of all existing roads and major trails, to maintain safe military operations and training. Mineral material sites are an exception to the one-mile off-limits designation. The military may use sand and gravel for its own purposes. Large amounts of sand and gravel are available just west of YTA, and there is high potential for localized sand and gravel in some stream valleys on YTA (BLM and U.S. Army 1994).

2.2.3 Soils

Knowledge of soil characteristics and classification forms the foundation for establishing effective management and rehabilitation programs for natural resources. A comprehensive soil survey for Fort Wainwright has not been completed. Fort Wainwright needs soils information to plan future development. For example, permafrost can create a myriad of problems for construction and military activities, but permafrost cannot be mapped without soil data. USFWS has stated concern over the effects of erosion on wetlands. Soils information could be used to determine risk levels.

A soil survey exists for the Main Post area of Fort Wainwright, but its accuracy and detail is inadequate for the needs of the installation. Most of the Main Post area is Chena alluvium, an unconsolidated silt-gravel mixture. Discontinuous permafrost lies just under the surface in some areas. The unconsolidated silt-gravel mixture freezes perennially. It has a high bearing strength when frozen, but it is subject to sliding and is difficult to compact when thawed. Northernmost portions of the post are in the foothills of the Yukon-Tanana Upland and consist of bedrock covered by muck and loess. Muck inhibits drainage, largely due to the presence of impermeable permafrost below the surface, and has very low bearing strength when thawed. Swale deposits, made up of poorly stratified silt, sand, and organic matter, are scattered along the Richardson Highway and in parts of South Post. These deposits have high ice content and freeze perennially (Nakata Planning Group 1987).

TFTA comprises different units of unconsolidated material, distributed in broad basins and elongated meander scars. Deposits grade from coarse gravel at heads of fans nearest the Alaska Range, to sand and silt at the bases of fans in the northern part of the basin. Coarse sediments on upper fans are well drained, but fine-grained sediments of lower fans are poorly drained. Frozen ground is within 20 inches of the surface in places and nearly 128 feet thick. Permafrost is absent beneath rivers and lakes, but is common wherever surface water or circulating groundwater is absent (Racine et al. 1990).

Soils on YTA have been mapped at a broad exploratory level of survey. South slopes consist of well-drained silt loams and are generally free of permafrost. Loams grade from shallow, gravelly silt near ridgetops, to silt loams on mid-slopes, to deep, moist silt loams on lower slopes. Drainage bottoms and depressions are occupied by shallow, gravelly silt loam covered with a thick layer of peat and underlain by permafrost. Soils on north-facing slopes are shallow, gravelly silt loams with thick covers and permafrost (BLM and U.S. Army 1994). A partial soil survey was completed in 2000. Figure 2-5 shows soils on Fort Wainwright.

Army activity has had its greatest impacts on soil productivity in the Main Post area due to construction. Soils in other areas have been impacted by military activities, localized around small arms ranges, roads, and other facilities. Stuart Creek may be experiencing more severe erosion due to explosions and burning. However, Fort Wainwright soils have been relatively unaffected by military training.

2.2.4 Water Resources

2.2.4.1 Surface Water

Fort Wainwright's surface water resources are diverse and include numerous rivers, streams, ponds, and lakes (see Figure 2-6). The Tanana and Chena rivers drain Main Post. TFTA is drained by several streams: Wood River, Crooked Creek, Willow Creek, Clear Creek, McDonald Creek, and Bear Creek among them, which all drain into the Tanana River directly, or by way of Salchaket Slough. Northern and northeastern portions of YTA are drained by the Chena River and its tributaries: the South Fork Chena River, Hunts Creek, and Horner Creek. The southern portion of YTA is drained by Ninety-Eight Creek, a tributary of the Salcha River and the Little Salcha River. Streams draining the western portion of YTA flow directly, or by way of Piledriver Slough, into the Tanana River. All streams originating on YTA have their headwaters in the Yukon-Tanana Uplands, in rolling glacier-free terrain (BLM and U.S. Army 1994).

The volume of flow fluctuates dramatically by season. During the long period of freeze, usually from October to May, flow is limited to seepage of groundwater from aquifers into streams. Many small streams freeze solid (zero discharge) during winter. Snowmelt typically begins in March or April and reaches its peak in June. Flow is greatest during June and July. By the end of July, most snow has melted, and a steady flow during August and September is sustained by rainfall. The Chena River is nonglacier-fed and reaches peak flow before the Tanana River, which is fed by meltwater from glaciers and snowfields in the Alaska Range (Nakata Planning Group 1987).

Surface water quality on YTA is generally good. The Chena River, from the Chena Slough to the confluence with the Tanana River, has been classified by the state of Alaska as Class A (suitable for agriculture, aquaculture, and industrial), Class B (suitable for water recreation), and Class C (suitable for growth and propagation of fish, shellfish, other aquatic life, and wildlife). The pH of the Chena River is slightly above neutral during winter and slightly below neutral in summer. Nitrogen concentration is high in relation to phosphate, which may be the limiting inorganic nutrient for phytoplankton production. Only naturally occurring iron concentrations were higher than the secondary state standards. The high iron concentration in the lower portion of the Chena River may be the result of surface water and groundwater discharge from swampy, muskeg areas in this region. Sediment loads are generally low. Nonglacier-fed streams generally carry less than 300 mg/l during high flow and as little as 10 mg/l during low flow periods (BLM and U.S. Army 1994).

Lakes and ponds are numerous on Fort Wainwright, and many freeze solid during the winter. Only a few are stocked by ADF&G. Blair Lakes are the largest lakes on TFTA.

The quality of the surface water has remained good since withdrawal of the land for military use. The only place where there is reason to suspect any adverse effects on water quality is Stuart Creek, and a monitoring program of that watershed is planned. There is no reason to suspect either degradation (beyond localized, temporary sedimentation) or improvement to most Fort Wainwright surface waters.

Erosion has not been identified as a significant threat to surface water quality. The area with the highest potential for erosion is Stuart Creek in YTA.

2.2.4.2 Groundwater

Groundwater is one of Fort Wainwright's most valuable natural resources. With the exception of naturally occurring metals, groundwater quality is good in the Fort Wainwright area.

Much of Fort Wainwright is underlain by an alluvial aquifer. Groundwater in the aquifer is recharged by the Tanana River, while the Chena River and direct infiltration of precipitation contribute small amounts. Groundwater potential is best along the alluvium of the Tanana River, where wells are capable of yielding 3,000 gallons per minute (gpm) at less than 200 feet in depth. The lowest potential is in the rolling hills of YTA, where wells produce around 50 gpm at the same depth (Nakata Planning Group 1987).

Figure 2-5. Fort Wainwright Soils.

See FWA INRMP Maps\FWA INRMP FIG02-05.PDF.

Figure 2-6. Fort Wainwright Surface Waters.

See FWA INRMP Maps\FWA INRMP FIG02-06.PDF.

Groundwater in the Fort Wainwright area tends to have relatively high, naturally occurring levels of metals, especially iron and arsenic. Elevated arsenic levels are prevalent in the upland areas. These are not related to human-caused pollution (Harding Lawson Associates 1996).

Army-related industrial activity in the Main Post may have caused groundwater pollution, generally associated with underground storage tanks, facilities where chemicals were stored, and places where chemicals were dumped during the early history of the post. These areas are being intensively monitored. Pollution is generally localized, and there is no indication of deep groundwater pollution. The recent trend has been toward improvement as Army restoration projects mitigate damage to groundwater quality. Practices that have led to this contamination have been discontinued; for example, underground storage tanks have been removed. All petroleum, oils, and lubricants are now stored in aboveground tanks surrounded by containment berms.

Due to past contamination of localized areas, primarily within the Main Post area, Fort Wainwright is classified as a Comprehensive Environmental Response, Compensation, and Liability (CERCLA) "Superfund" site. Remediation is ongoing. Groundwater management consists of restoration projects associated with individual sources of pollution, generally associated with the CERCLA "Superfund" designation. These projects are not classified as natural resources management and are not included within this Integrated Natural Resources Management Plan (INRMP).

2.2.5 Climate

Fort Wainwright has the northern continental climate of the Alaskan interior, which is characterized by short, moderate summers, long, cold winters, and little precipitation or humidity. Weather is influenced by mountain ranges on three sides, which form an effective barrier to the flow of warm, moist, maritime air during most of the year. Surrounding uplands also cause settling of cold, arctic air into Tanana Valley lowlands.

Average monthly temperatures in Fairbanks range from –11.5oF in January to 61.5°F in July, with an average annual temperature of 26.3°F. The record low temperature is –66°F, and the record high is 98°F. The average frost-free period is 95-100 days.

Prevailing winds are from the southwest in June and July, and from the north and northeast in winter. Average wind velocity is 5.3 miles per hour (mph). The greatest average wind speed is in spring, with a high of 40 mph recorded in Fairbanks. Winds are 5 mph or less 60% of the time. Thunderstorms are infrequent, occurring only during late spring and early summer.

Average annual precipitation is 10.4 inches, most of which falls as rain during summer and early fall. Average monthly precipitation ranges from a low of 0.29 inches in April to a high of 1.86 inches in July. Average annual snowfall is 67 inches, with a record high of 168 inches during the winter of 1970-71. Average annual relative humidity is 55%, with lowest levels during spring and early summer (38% during mid-afternoon in May). Heavy fog is relatively common during December and January, with four or five foggy days each month. Ice fog can be expected any time temperatures drop below –30°F, but is normally restricted to areas near human settlements where moisture is emitted from burning fuels (Bonito 1980).

2.3 Biological Resources

2.3.1 Biodiversity

Most of the land was relatively undisturbed when it was withdrawn for military use. Because there are little or no data on most species prior to the last 10 years or so, it is unknown how the military presence has affected biodiversity on Fort Wainwright. Changes in ecosystems have been localized and may have affected species abundance for short periods, but probably have not affected overall species richness.

There is no evidence that Army use has affected any plant or animal species beyond specific sites of construction or military activity. Greatest losses of habitat are associated with the Main Post due to construction and associated urban development and use.

Fort Wainwright is part of the historic range of the Fortymile caribou herd.

Effects of noise on wildlife from military activities at Fort Wainwright are unknown. Military activity does negatively affect individual animals and could affect populations. No studies have been conducted on Fort Wainwright to measure military activity disturbance on specific species. Habitat Management Plans completed as part of this INRMP will identify sensitive wildlife habitats and implement management to protect these areas.

2.3.2 Flora

Fort Wainwright encompasses a large amount of land with a wide array of physiographic features. Vegetation patterns are influenced by climate, soil, topography (slope, aspect, and elevation), depth to water table, permafrost, and fire. Native vegetation was removed from much of the Main Post during original construction of Ladd Field in the 1940s. Due to landscaping and other human activities, vegetation of the Main Post does not reflect natural vegetation patterns of the area (Nakata Planning Group 1987).

Fort Wainwright has four vegetation types: moist tundra; treeless bogs; open, low-growing spruce forests; and closed spruce-hardwood forests. The white spruce-paper birch forest of interior Alaska is often called the boreal forest or taiga. Vegetation types of interior Alaska form a mosaic and reflect fire history, slope and aspect, and presence or absence of permafrost (Viereck and Little 1972).

2.3.2.1 Vegetative Profile

A typical vegetation profile from lowland, up a south slope and down the north slope, would include the following: water, barren, high brush, deciduous forest, white spruce forest, moist tundra, black spruce forest, and mixed forest (Bonito 1980). This profile does not precisely match Viereck and Little's (1972) vegetation types, which were mapped on a statewide scale. Wetlands occurs at various altitudes and sometimes only during early successional stages. Localized conditions often result in various combinations of vegetation.

- **Barren Land:** Barren ecosystems on Fort Wainwright are recently deposited gravel bars in rivers.
- **High Brush:** The high brush ecosystem exists as a transitional zone, or ecotone, between forests and barren areas or tundra. It normally is a narrow vegetation band along floodplains or just above tree line. The size of the transitional zone varies dramatically, and in places where there is a well-defined tree line, it may be quite small. The high brush area, however small, is important ecologically. It sustains small to medium-sized woody plants and shrubs (no higher than 20 feet), including alder (*Alnus* sp.), willows (*Salix* sp.), cottonwood (*Populus* sp.), birch (*Betula* sp.), mountain ash (*Sorbus* sp.), and prostrate white spruce (*Picea glauca*). Along floodplains, high brush forms a thick, almost impenetrable barrier. There is little or no ground cover. In subalpine settings, stands may be thinner and more persistent. Ground vegetation is grasses, mosses, small shrubs and forbs, and lichens that often form thick layers. A mixture of wildlife from the alpine and forested communities uses the area. The high brush ecosystem is particularly important for moose forage (Bonito 1980).
- **Forests:** Forests are dominant, diverse ecosystems on Fort Wainwright. Vegetation ranges from pure stands of spruce or hardwoods to spruce/hardwood mixtures. Black spruce (*Picea mariana*) stands are found where drainage is poor, such as flat valley bottoms, lakesides, and muskegs. White spruce (*P. glauca*) stands are rare due to anemic soils and frequent wildfires. Pure stands of paper birch (*Betula papyrifera* var. *humilis*) and quaking aspen (*Populus tremuloides*) are commonly found

in well-drained uplands and ridge tops. Most forests are heterogeneous mixtures of spruce (white and black) and hardwoods. Predominant hardwoods are birch, quaking aspen, and balsam poplar (*P. balsamifera*). Higher, well-drained ridges tend toward stands with a white spruce/birch mixture in early stages, leading to pure spruce at the climax stage. In other areas, aspen forms a canopy over an understory of white spruce. Bottomland white spruce/balsam poplar forest occurs on level floodplains, low river terraces, and south slopes. White spruce is dominant and reaches a height of 110 feet. Stands may persist for 50 to 200 years before being replaced by black spruce. Moss gradually accumulates as the forest ages. The deep mat insulates the permafrost below and prevents summer thaw, giving rise to wetter conditions that favor black spruce. Lowland black spruce/hardwood is the most common forest type in interior Alaska. On colder, northern aspects, black spruce may occur up to 2,500 feet (Bonito 1980).

- **Moist Tundra:** Moist tundra occurs on top of Fort Wainwright hills at 2,500 to 3,000 feet elevations. This windy and cold area is above tree line and supports only the hardiest vegetation in a short growing season. Upper reaches of this zone are generally steep and rocky. Vegetation is sparse-scattered grasses, dry land sedges, lichens, club mosses, and low mat-forming herbaceous and woody plants. Woody perennials rarely exceed three feet in height. This vegetation type is extremely sensitive to damage (Bonito 1980).

- **Wetlands:** On Fort Wainwright, wetlands can be divided into marshes and shrub wetlands. Much of TFTA is covered by treeless, herbaceous marsh. These marshes are unique in that they are largely dependent upon groundwater discharge and usually develop as floating vegetation mats over deeper water. The floating mat consists of a dense network of roots and organic material of variable thickness. Standing water may or may not be present on top of the undisturbed mat and may or may not be moving. Dominant mat-forming plants are graminoid sedge, grass and horsetail species, and herbaceous broadleaf forbs, such as buckbean (*Menyanthes trifoliata*) and marsh marigold (*Caltha palustris*). In addition, submerged aquatics, such as bladderwort (*Utricularia* sp.), and floating aquatics, such as duckweed (*Lemma* sp.), are frequently found in these areas. Trees and shrubs are absent, except for occasional willows (Racine et al. 1990). These wetlands attract large numbers of trumpeter swans and other waterfowl. Williams (1994) studied vegetation patterns in the Tanana Flats wetlands complex. Her report includes plant species data from five survey plots and relationships among these species.

Shrub wetlands, also known as bogs, muskeg, and low brush, are associated with slightly higher relief on the edges of marshes, and in poorly-drained basins and depressions with cold, waterlogged soils. The surface consists primarily of a thick layer of peat over a mottled, gray silt or silt loam. The water table, if not exposed, is found only a few inches down. During periods of heavy precipitation, bogs may form temporary lakes. Depth to ice-rich permafrost is often less than 30 inches. Ground cover is characterized by dense accumulations of mosses, lichens, sedges, rushes, liverworts, mushrooms, and other fungi. Stunted black spruce occasionally appears. Along margins of bogs and in drier areas, grasses, small shrubs, berries, and woody plants, such as willow and bog birch (*Betula glauca*), proliferate (Bonito 1980).

The interaction of soils, permafrost, and vegetation on lowland sites results in a dynamic mosaic of ecosystems. Dead and falling trees along the boundary between marsh and forested upland or forested islands suggest massive permafrost thaw and subsidence. Heat is transferred from marsh water to the permafrost, with subsequent melting and subsidence of the upland surface. This results in shrinkage of forested islands and uplands. Conversely, forested islands may expand through a rising of the permafrost table. This results in the rise of the peat above the water level, improving drainage and allowing trees to become established (Racine et al. 1990).

Fire plays a significant role in forest development. More than 100,000 acres have burned on Fort Wain-

wright since 1980. White spruce stands may persist for 200 years in the absence of fire. Alternatively, over a 60-year period, a burned stand can progress from willow to aspen/birch to white spruce/birch, and eventually to a mature black spruce forest. Wet muskeg sites may recover to complete vegetative cover in three to five years, while lichens may take 50-100 years. Single fire events in a white spruce/hardwood stand may perpetuate white spruce/birch communities, while repeated fires result in birch/aspen communities (Bonito 1980).

2.3.2.2 Floristics Inventory

Floristics inventory activities set the foundation on which many decisions regarding land management are based. Inventories can range in intensity, based on their goals and objectives. The following lists the goals for Fort Wainwright's floral inventory:

- Identify flora at Fort Wainwright
- Establish baseline vegetation data for the ITAM program
- Establish voucher museum mounts to be used for future reference
- Identify rare, threatened, or endangered plants, or other species that may be of special interest

During 1995-1996, CRREL conducted a floristic inventory for USARAK at Fort Wainwright (Tande et al. 1996). The inventory focused on vascular plants, so cryptogams (i.e., mosses and lichens) were not identified. The inventory found 491 taxa (including subspecies and varieties), representing 227 genera in 72 families. This is about 26% of Alaska's vascular flora. At least 10 taxa collected represented extensions of known ranges (Tande et al. 1996).

Plants were collected from five units within the Tanana Flats of the Tanana-Kuskokwim Lowland, three units of the Yukon-Tanana Upland, and the Main Post area. A total of 1,005 collections were made at 123 sites within these units. CEMML mounted three sets of collected plants. One set was laminated and remains at Fort Wainwright, and the other two are dry mounted and stored at the University of Alaska Museum, Fairbanks.

All established goals have been met by the 1995-1996 inventory. Additions to the floristics inventory will occur as additional plants are identified, usually through the LCTA monitoring program.

2.3.2.3 Threatened or Endangered, and Species of Concern Plants

A comprehensive survey of rare plants was included as part of the floristic inventory for Fort Wainwright conducted in 1995. Only two plant species on the federal endangered species are known to occur in Alaska. Neither species' current or historic ranges include Fort Wainwright, and a report released in 1996 indicated that there are no federally listed endangered or threatened plant species on Fort Wainwright (Tande et al. 1996).

There are, however, 16 vascular plant species of concern that are known to occur on Fort Wainwright. These plants are being tracked by the Alaska Natural Heritage Program because they are thought to be uncommon or rare in Alaska and/or uncommon or rare globally (Alaska Natural Heritage Program 2000). These species are listed in Table 2-1 and are documented in the survey results of Tande et al. (1996).

There are no legal ramifications from these listings, rather they are generated by the Heritage Program to help track the occurrence of these taxa across the state as more botanical work is conducted. The categories listed do not indicate known threats to these species, but they do represent the rather few collections known for each taxa in Alaska and the geographic distribution of those collections. All of these taxa are listed for management in the ecosystem management program for Fort Wainwright (see Chapter 3).

No further inventories for threatened or endangered, and species of concern plants will be conducted in the next five years. The location of any plants that are being tracked by Alaska's Natural Heritage Program will be mapped.

2.3.2.4 Ecological Land Classification

An ecological land classification was done for Fort Wainwright lands during 1994, 1995, and 1998. This report included mapping by geomorphology, permafrost, vegetation, ecotypes, ecosubdistricts,

Table 2-1. Rare Plant Species Occurring on Fort Wainwright.

SPECIES	ALASKA NATURAL HERITAGE PROGRAM RANKINGS	
	GLOBAL	STATE
Apocynum androsaemifolium	demonstrably secure	imperiled/rare or uncommon
Artemisia laciniata	demonstrably secure	imperiled
Carex crawfordii	demonstrably secure	imperiled or rare
Ceratophyllum demersum	demonstrably secure	imperiled
Cicuta bulbifera	demonstrably secure	critically imperiled or imperiled
Cryptogramma stelleri	demonstrably secure	imperiled or rare
Dodecatheon pulchellum ssp. pauciflorum	demonstrably secure	imperiled
Festuca lenensis	cause for concern	imperiled or rare
Glyceria pulchella	demonstrably secure	imperiled or rare
Lycopus uniflorus	demonstrably secure	rare or uncommon
Minuartia yukonensis	rare or uncommon	rare or uncommon
Myriophyllum verticillatum	demonstrably secure	rare or uncommon
Oxytropis tananensis	imperiled or rare	imperiled or rare
Pedicularis macrodonta	cause for concern	rare or uncommon
Rorippa curvisiliqua	demonstrably secure	critically imperiled
Rosa woodsii var. woodsii	demonstrably secure	critically imperiled or imperiled

and ecodistricts (Jorgenson et al. 1998). The ecological land classification is a hierarchical means to classify land according to various ecological scales. Figure 2-7 shows a map of the land classification categories.

Ecotypes are created by combining associations of vegetation types and geomorphological classes. Ecotypes delineate areas with homogeneous topography, terrain, soil, surface-form, hydrology, and vegetation. Ecosections are areas with relatively uniform geomorphic features that have recurring patterns of soils and vegetation. Several vegetation classes may be included in an ecosection, but they are usually related because they occur as different stages in a successional sequence. Ecodistricts are broader areas with similar geology, geomorphology, and hydrology and are similar to physiographic units.

A pilot ecological land survey was completed on an area (200 km^2 [78 $miles^2$]) near Clear Creek on Fort Wainwright by CRREL (Jorgenson and Smith. 1995). This study indicated 20 ecosites, 12 ecosubdistricts, and five ecodistricts. The Legislative Environmental Impact Statement (LEIS) for the YTA land withdrawal renewal contains a description of the 32 ecosites, four ecosubdistricts, and one ecodistrict on YTA (Center for Ecological Management of Military Lands 1998).

2.3.2.5 Wetlands

Wetlands on Fort Wainwright consists of freshwater marshes and shrub wetlands. Some wetlands may qualify as jurisdictional wetlands as defined in Section 404 of the Clean Water Act. Jurisdictional wetlands are determined by the Army Corps of Engineers on the basis of soils, vegetation, and hydrology. Fort Wainwright has two wetlands surveys completed: the National Wetlands Inventory (NWI) and the Waterways Experiment Station (WES) inventory.

The NWI for Fort Wainwright was completed in 1992 and included 100% coverage of 11 of 14 map quads with less than 100% inventory of the other three quads. NWI results were digitized by CEMML in 1997 (Figure 2-8). Some smaller wetlands and those obscured by dense forest cover may not be included in this inventory, which renders this survey inadequate for installation natural resources management programs.

The U.S. Army Engineer WES completed a wetlands delineation of Fort Wainwright in 1998. The study included a review of existing information, a wetlands identification, a GIS base map, a wetlands characterization, and a final report. Wetlands were divided into five groups that do not clearly delineate all areas as either wetlands or upland. It is necessary to conduct on-site investigations before making management decisions involving Section 404 of the CWA.

2.3.2.6 Forest Resources

A forest inventory is an integral part in establishing a plan for managing forest resources. A preliminary extensive inventory was sponsored by BLM and completed by Tanana Chiefs Conference (1993) with assistance from the State of Alaska Division of Forestry. The following goals were established to direct inventory activities:

- Distinguish between forested and non-forested lands
- Identify forested lands that have or may have commercial potential
- Determine acreage of potential commercial timbered lands
- Map forested areas
- Determine the commercial potential of these lands

The inventory included the Main Post, the periphery of TFTA, Eielson AFB, and YTA, excluding closed areas. Total land area considered for forest management was 325,169 acres for the Main Post and TFTA, and 290,308 acres on the YTA unit. Forty-eight percent of the Tanana Flats unit (156,927 acres) and 75% of the YTA unit (217,751 acres) were classified as forested land, indicating areas with commercial forestry potential. The remainder was classified as non-forest land, rivers, or water. Most of the survey was done using aerial photos and very little groundwork. The minimum mapping unit was approximately 15 acres. Sawtimber was defined as conifers greater than nine inches diameter at breast height (dbh) and deciduous trees greater than 11 inches dbh. Pole timber was defined as conifers 5-9 inches dbh and deciduous trees 5-11 inches dbh. Table 2-2 (see p. 2-21) summarizes results of this survey in terms of commercial timber available on Fort Wainwright.

Potential annual harvest levels were calculated using the area control method with the following assumptions:

- Regeneration of softwoods and hardwoods can be quite variable, but it is estimated that 10 years will be required for trees to become established and reach “free to grow” status.
- White spruce, birch, and aspen are crop species; balsam poplar, black spruce, and tamarack are likely to remain non-marketable in the near future.
- The estimated annual allowable harvest is based on present average net volumes.
- White spruce sawtimber can be produced in 120 years; hardwood sawtimber and fuel wood can be produced in 80 years.

Based on inventory data and above assumptions, 229 acres/year of white spruce sawtimber could be harvested from the Tanana Flats, yielding 324,000 cubic feet or 1,282,000 board feet. Potential hardwood harvest was 251 acres/year, yielding 152,000 cubic feet or 601,432 board feet. For the YTA unit, potential annual harvest level of white spruce sawtimber was 123 acres/year, yielding 92,000 cubic feet or 340,000 board feet. Potential hardwood harvest was 317 acres/year, yielding 183,000 cubic feet or 676,304 board feet.

Potential harvest may not be actual harvest. Ecosystem management of forests on Fort Wainwright dictates that considerations other than purely commercial, such as wildlife values, are investigated prior to cutting timber.

2.3.2.6.1 Forest Stand Types – Condition

Upland Forest Condition. Upland forests include birch and aspen forests, mixed hardwood-white spruce, and white spruce forests on relatively well-drained, warm sites. Approximately 70% of the forested land on Fort Wainwright are upland forests. Under natural conditions fire is common. Fire cycles are estimated to be 100 - 150 years. Fires occur in a wide range of sizes, often creating openings of hundreds to many thousands of acres. A variety of other disturbances can also occur, in-

Figure 2-7. Fort Wainwright Vegetation.

See FWA INRMP Maps\FWA INRMP FIG02-07.PDF.

Figure 2-8. Fort Wainwright Wetlands.

See FWA INRMP Maps\FWA INRMP FIG02-08.PDF.

Table 2-2. Timber Resources on Fort Wainwright (Tanana Chiefs Conference 1993).

Unit	Species	Acreage	Area %	Volume*	Volume %
TFTA	**Sawtimber**				
	White Spruce	5,240	11.4	56.06 mil	27.2
	Balsam Poplar	1,777	3.9	5.15 mil	2.5
	White Spruce/Hardwood	1,217	2.7	11.686 mil	5.7
	White Spruce/Balsam Poplar	3,954	8.6	48.241 mil	23.3
	Total Sawtimber	*12,188*	*26.6*	*121.142 mil*	*58.7*
	Pole Timber				
	White Spruce	1,174	2.6	5.05 mil	2.4
	Balsam Poplar	3,578	7.8	4.65 mil	2.3
	Hardwood	10,547	23.0	11.602 mil	5.6
	White Spruce/Hardwood	5,309	11.6	18.05 mil	8.7
	White Spruce/Black Spruce	2,086	4.6	2.503 mil	1.2
	White Spruce/Balsam Poplar	5,259	11.5	32.606 mil	15.8
	Black Spruce/White Spruce/Hardwood	5,649	12.3	10.732 mil	5.3
	Total Pole Timber	*33,602*	*73.4*	*85,196 mil*	*41.3*
YTA	**Sawtimber**				
	White Spruce	526	1.0	5.625 mil	5.2
	Balsam Poplar	16	0.0	0.047 mil	0.0
	White Spruce/Hardwood	61	0.1	0.581 mil	0.5
	White Spruce/Balsam Poplar	612	1.1	7.470 mil	6.9
	Total Sawtimber	*1,215*	*2.3*	*13.722 mil*	*12.6*
	Pole Timber				
	White Spruce	470	0.9	2.020 mil	1.9
	Hardwood	24,437	45.4	26.881 mil	24.7
	Balsam Poplar	70	0.1	0.092 mil	0.1
	White Spruce/Hardwood	8,881	16.5	30.195 mil	27.7
	White Spruce/Black Spruce	1,212	2.3	1.455 mil	1.3
	White Spruce/Balsam Poplar	279	0.5	1.729 mil	1.6
	Black Spruce/White Spruce/Hardwood	17,307	32.1	32.882 mil	30.2
	Total Pole Timber	*52,656*	*97.7*	*95.253 mil*	*87.4*

*Board Feet

cluding storm breakage or windthrow, and insect and disease outbreaks. Hardwood stands are usually the first forest cover following fire, with spruce developing more slowly until mixed stands occur. Stands dominated by white spruce are the oldest and least common upland forest type, generally growing only where no severe natural disturbance has occurred for 100 years or more.

For the last several decades, wildland fire has been actively suppressed on Fort Wainwright, which has helped decrease the natural disturbance level in upland areas. The high level of human-caused disturbance in the early 1900s and fire suppression since the 1950s have resulted in a distribution of age classes that is heavy in the 60 to 120 years category with fewer younger stands. It is important to maintain younger stands for timber recruitment and wildlife habitat. Older forests are more susceptible

to severe wildland fire and to insect and disease damage. More species and age diversity will result from the careful application of fire management techniques and harvest activities. In areas where private property and military infrastructure are not threatened, wildland fires will be allowed to burn.

Lowland Forest Condition. Lowland forests include balsam poplar, mixed balsam poplar-spruce, and white spruce stands. Mixed birch-spruce stands also occur, especially on older lowland sites. Approximately 30% of the forested land on Fort Wainwright are lowland forests. Lowland sites are subject to a variety of natural disturbances – erosion, flooding, and ice damage near active river channels, fire, insects and disease, windthrow, and themokarsting. From about 1900 to 1940, extensive harvesting occurred in lowland sites, especially along the Tanana River. Mining also disturbed lowland forests. These disturbances were typically smaller scale than the large upland fires, and they created a complex mosaic of stand types and ages. Hardwoods are usually the first forest cover to develop, followed by mixed hardwood-spruce stands, and finally white spruce. As in the uplands, white spruce is the oldest and least common forest type, developing only in the absence of major disturbance for extended periods. Overall, disturbance is less common in lowlands than uplands, as evidenced by the presence of older stands and a greater range of stand ages, including stands greater than 180 years old. Because fire is only one of the many disturbances in the lowland, fire suppression has had less effect on overall disturbance of lowland forests than on uplands.

2.3.2.6.2 Forest Stand Types – Characteristics and Potential Use

White Spruce Type: White spruce is a late successional species for much of interior Alaska as well as Fort Wainwright. Generally occurring on well-drained upland sites, white spruce is rarely found on waterlogged sites or extremely dry, sunny slopes. On north and east-facing slopes, white spruce is confined to drainage ways and tops of slopes. The presence of either aspen or cottonwood in a spruce stand is often an indicator of commercial forest land. Although pure stands occur along the Tanana River, white spruce is more commonly found within mixed deciduous stands. In time, white spruce sometimes dominates these sites. Although the desire may be to manage for a single stand type, mixed stands are the natural conditions on most sites.

Early succession stage forests and mixed stands are important to moose. Many neotropical migratory birds also require early successional stages for nesting and foraging. Some species nest in "shrubby" thickets and require a hardwood component. On the other hand, some species require dense stands of young conifers. Silviculture practices to obtain and maintain mixed stands are ideal for most wildlife species. Potentially, anything done to favor white spruce will also favor hardwood establishment. On good sites along the Tanana River, white spruce averaging 16 to 18 inches dbh at less than 150 years of age are not uncommon, some trees in such stands exceed 24 inches dbh at 125 years. Mature trees usually do not exceed 85 to 100 feet in height. On upland sites, mature white spruce commonly range from 14 to 18 inches dbh, and on the best sites, trees can produce spruce 15 to 16 inches dbh by 50 years of age. White spruce is highly valued for house and sawlogs and firewood.

Paper Birch Type: Paper birch is widely distributed in YTA uplands and to a lesser degree in TFTA. Maximum heights seldom exceed 80 feet, and more frequently, they are about 70 feet at 50 years of age. Most stands are even-aged except when overmature. Overmature paper birch commonly range from 12 to 16 inches dbh, and some decadent stands have trees over 18 inches. Fungal conks have weakened many trees, an indication of internal decay.

Following tree harvest, birch can naturally regenerate, but not as readily as aspen. Tree distribution is limited by stem density and distribution of the harvest stand. Seeding regeneration is often necessary to produce adequately stocked stands. Birch produces large quantities of seed that can disperse for long distances, thus clear cutting is one option. A key aspect of birch regeneration is seedbed condition. Mineral soil seedbeds are best, where seeds may remain viable in the soil for up to a decade. Birch normally occurs on all exposures, except northern slopes, and can tolerate sites underlain by

discontinuous permafrost. Birch wood is considered by many to be the best firewood in Alaska. In its browse stage, birch has value to wildlife. It has potential as veneer or pulp manufacturing when mature.

Quaking Aspen Type: Aspen is predominantly limited to uplands of YTA on relatively dry southern or southwestern exposures. Dense stands mature after approximately 60 years of age and begin to open up. Maximum height in mature pure stands seldom reaches 60 feet. Aspens commonly reach 10 to 11 inches dbh, and some sites support older trees to 18 inches dbh. The most vigorous stands occur on warm, dry slopes since aspen can tolerate very arid conditions that other tree species cannot. It is almost completely absent from cold, wet, northern slopes and lowlands where black spruce dominates.

Aspen characteristically produces abundant root suckers that grow rapidly and form dense patches, surrounding killed trees following manual clearing or fire. Aspen can dominate a site within a few weeks following a fire and is readily managed by clear cutting and vegetative reproduction.

While aspen has limited value as fuel wood, it is an important habitat and food source in younger succession stages, particularly to moose and ruffed grouse on YTA. Aspen commercial values could increase if an interior Alaska pulpwood industry develops.

Balsam Poplar Type: Balsam poplar stands are found along alluvium deposits of the Tanana River in TFTA and bottomlands of smaller floodplains in YTA. Trees can reach diameters of 48 inches and on the best sites can be more than 20 inches dbh at 30 years of age. This species is well adapted to river bars, stream bends, and lake shores, and may form nearly closed stands. As the height of river terraces increases, flooding becomes less frequent, allowing white spruce to establish and increase in size and density. Eventually, white spruce becomes codominant, and balsam poplar shows signs of decline. Aspen is a rare associate, and sometimes birch is a minor associate. Occasionally, balsam poplar regenerates on upland burns and is usually replaced by white spruce in the long-term succession sequence.

Timber values for balsam poplar are not high. Utilization is limited to low-grade saw lumber and firewood.

Black Spruce Type: Black spruce stands cover vast areas of the landscape on Fort Wainwright. Stands are usually found on poorly-drained sites and where permafrost is near the soil surface. Sites are cold, wet and poorly aerated, often due to deep continuous mats of moss that insulate the permafrost below and prevent summer thaw. Stands of this type are generally encountered in relatively flat valley bottoms or on flat to gently rolling land on northern exposures. Permafrost often limits other types of vegetation. Higher, dry hummocks may support islands of hardwoods, and lower wet sites can support tamarack or willow. Stand densities on better sites are high, and trees are of even height, rarely exceeding 10 to 11 inch dbh. Pure stands of short, narrow-crowned black spruce are common around lake and bog margins on TFTA and YTA.

Black spruce stands are treatable with tree crushing equipment or hydro-ax cutting to stimulate reproduction and growth of willows, aspen, and other browse species by exposing and heating the soil. Prescribed burning remains a viable option to return stands to the shrub/herb stages of succession. Utilization of black spruce is similar to that of white spruce if tree sizes and stands volume permit. However, commercially significant stands on Fort Wainwright are marginal.

Brush Type: Permanent brush fields occur at high mountain elevations, in small stream valley bottoms, and on disturbed sites, as pioneer vegetation. These areas are occupied by alder, willow, and dwarf birch. There is little evidence that commercial forest stands ever have or will occupy high elevation sites. The presence of scattered krummholz spruce, either in the brush fields or bordering them, is evidence that the land will not support commercial forest growth. Thickets of willow and alder along floodplains or disturbed sites often form dense thickets for 10 to 20 years. Alder is often associated with disturbed sites such as gravel pits, road shoulders, rights-of-way, and military trails.

Alder provides important cover for a variety of wildlife and plays a significant role in fixing nitrogen. Early succession willow stages are important moose habitats and can be relatively productive. Annual biomass production of 43 to 86 cubic feet per acre in 5-to-20 year-old alder/willow stands on floodplains has been reported.

2.3.2.6.3 Forest Condition

The total forested land area on Fort Wainwright is 374,678 acres (Tanana Chiefs Conference 1993). Of this, limited areas are currently available for cutting fuel wood and Christmas trees (or any commercial harvest by the Army).

Commercial forestry has never been significant on Fort Wainwright, either before or during Army occupation. The capability of Fort Wainwright to support commercial forestry is increasing due to maturation of the forest in many areas. The installation can meet the demand for fuel wood and Christmas trees, but because it can only be taken from the Main Post, there are projected shortages in fuelwood.

2.3.3 Fauna

Most vertebrate species indigenous to central Alaska can be found on Fort Wainwright (Figures 2-9a and 2-9b).

2.3.3.1 Mammals

The Alaska Department of Fish and Game (ADF&G) designates a variety of mammal species as big and small game. A list of mammal species is located in Appendix F of the INRMP.

2.3.3.1.1 Game Species

Game species found on Fort Wainwright are managed by ADF&G. ADF&G monitors these species to determine population status, reproductive success, harvest and home ranges. ADF&G also sets bag limits and seasons for these species. USARAK will cooperate with ADF&G and contribute funds to help monitor or study game species on an annual basis to ensure sustainable harvests, based on fund availability. A list of mammal species is located in Appendix F of the INRMP.

Bears

Black and grizzly bears are found throughout YTA and TFTA. Both are hunted, although black bears are taken more often due to their larger population.

Black Bear

In 1988 USARAK and ADF&G began a cooperative study of black bear demographics on TFTA. Between 1988 and 1991, 45 individual bears were captured 111 times. From 1988 to 1990, 29 radio-collared bears were located 916 times. The 29 free-roaming bears caught included eight adult females (mean age 12 years), nine sub-adult females (mean age 3.2 years), four adult males (mean age 7.8 years), and eight sub-adult males (mean age two years). The sightability of non-denning bears during tracking flights was approximately 49%. Mean home range sizes were used to estimate densities of 46-67 bears/1,000 km^2.

Forty-seven den sites were located. Fifteen den sites were in spruce habitat types, nine in birch/aspen stands, seventeen in alder/willow shrubs, six in heath meadows, and none in marshes. Availability of denning sites is not a limiting factor.

Bear harvest appeared to be directly linked to access, with a mean harvest of 11.2 bears/year from TFTA and 9.8 from YTA during the study period. Overall harvest was judged to be sustainable, although areas in YTA may have localized overharvest (Hechtel 1991). No serious black bear conservation problems were identified related to Fort Wainwright land management.

Since 1974 (when harvested black bears were first required to be sealed), black bear harvest on TFTA has varied from zero (1975) to 25 (1981), and harvest on YTA has varied from one (1979) to 15 (1977). Black bear harvest on TFTA is primarily opportunistic by moose hunters in fall, while YTA harvest occurs mostly during spring (Hechtel 1991). Since 1974, the bag limit has been three bears annually with no closed season.

Bear baiting was closed from 1977 through the 1982-83 season due to conflicts with pipeline construction activity. Since the 1983-84 season, the practice has been legal. Baiters must have permits. Harvest across Game Management Unit (GMU) 20

Figure 2-9a. Fort Wainwright Wildlife Habitat.

See FWA INRMP Maps\FWA INRMP FIG02-09a.PDF.

Figure 2-9b. Fort Wainwright Wildlife Habitat.

See FWA INRMP Maps\FWA INRMP FIG02-09b.PDF.

Figure 2-10. Moose Habitat.

See FWA INRMP Maps\FWA INRMP FIG02-10.PDF.

has generally been higher since re-opening of baiting, but the difference is not statistically significant (Hechtel 1991).

Grizzly Bear

USARAK has provided ADF&G with over $100,000 for the study of family relationships and among-population movements (using DNA analysis) and effects of poaching on grizzly (or brown) bears.

Grizzly bears are hunted during all but summer months. The bag limit is one bear every four regulatory years. Grizzly bears may not be taken over bait. Only a few grizzly bears (0-3 annually during the past five years) are harvested from Fort Wainwright.

Moose

Fort Wainwright is included in ADF&G's GMU 20, which supports the state's largest moose harvest. Although not considered good winter moose habitat, TFTA supports high concentrations during spring and fall, and is the largest known moose calving area in interior Alaska (Nakata Planning Group 1987). Moose are also present on Main Post and found in larger numbers in YTA (Figure 2-10).

Caribou

Fort Wainwright is part of the historic range of the Fortymile caribou herd, but rarely are caribou now found on the installation. During the early 1900s, this herd was the largest in Alaska and one of the largest in the world, ranging over 85,000 square miles. In 1920, the herd was estimated at 568,000, but herd size fell to 10,000-20,000 in the 1930s. The herd grew to perhaps 60,000 in 1956, but it decreased to about 6,500 by 1973. This crash was probably due to overharvesting, unfavorable weather, and wolf predation. By 1990, the herd had increased to about 22,000 caribou, and has remained stable until 1995. In 1995 the herd began to increase, and by 2000, the herd was estimated at 35,500. No caribou have been taken from Fort Wainwright in recent years.

Wolves

According to the ADF&G, there are three wolf packs whose ranges may include Army lands in the Tanana Flats. There are an additional three packs south of Tanana Flats on Fort Greely and about four packs west of the Wood River. It is assumed that wolf populations are stable. Hunting is allowed during the normal state season for Unit 20 from August through April with a bag limit of five. Trappers may take an unlimited number of wolves during the trapping season.

Wolves are currently monitored by ADF&G to determine pack size, home range, and effects on prey species.

2.3.3.1.2 Small Mammals

Small mammals play important ecological roles as secondary consumers and as prey for a variety of predators. The Alaska tiny shrew is newly described and apparently rare, found in small numbers in widely separated parts of Alaska. Other small mammals that are potentially rare inhabitants of YTA include the long-tailed vole, northern bog lemming, brown lemming, and water shrew.

2.3.3.1.3 Furbearers

Many Alaskan mammal species are listed as furbearers by the ADF&G. Population monitoring, trapping seasons and bag limits are set by ADF&G for these species.

Trappers are required to register their traplines with the Natural Resources office as of 1999. Trapping policy, harvest collection and monitoring, and management objectives are listed in the Fort Wainwright Outdoor Recreation Management Plan.

2.3.3.2 Birds

Appendix F lists birds found on the installation.

Threatened, Endangered, or Rare Birds

The American peregrine falcon (*Falco peregrinus anatum*) was recently delisted from endangered species status. Though not known to nest on Fort Wainwright, it is an infrequent migrant. Potential peregrine falcon habitat for feeding or nesting can be found in the Salcha Bluff area (Ritchie and Rose 1998). Although this raptor has been recently delisted, the USFWS requests that USARAK continue consultation on any projects taking place in YTA that may hinder their recovery.

A federally listed threatened species in the lower 48, the bald eagle (*Haliaeetus leucocephalus*), is locally common. It nests in the Granite Tors in the State Recreation Area just north of YTA, and along the Salcha and Tanana Rivers (Ritchie and Rose 1998). The golden eagle (*Aquila chrysaetos*) is a resident of forest and alpine habitats of the installation (Nakata Planning Group 1987).

A survey of cliff and tree nesting raptors in YTA was conducted in 1998 by ABR (Anderson et al. 2000). Five potential cliff sites were found in YTA, but the habitat value for these were judged poor to fair. The small number and size of streams in YTA limits the potential for tree nesting bald eagles.

Seven birds are listed as state-sensitive (USARAK and Center for Ecological Management of Military Lands 1999): the gray-cheeked thrush, blackpoll warbler (*Dendroica striata*), American peregrine falcon, golden eagle, olive-sided flycatcher (*Contropus borealis*), Arctic peregrine falcon (*Falco peregrinus tundrius*), and Townsend's warbler (*D. townsendii*). The gray-cheeked thrush was commonly noted in recent surveys (BLM and U.S. Army 1994). All but the Arctic peregrine falcon have been confirmed on Fort Wainwright (USARAK and the Center for Ecological Management of Military Lands 1999).

Two species confirmed on Fort Wainwright are considered sensitive by the U.S. Forest Service: the osprey (*Pandion haliaetus*) and trumpeter swan. A number of species confirmed on Fort Wainwright are included on the Boreal Partners in Flight Working Group (1998) as target or priority species for monitoring because of declines in populations noted across the Americas. There are no legal requirements to manage these species, although all migratory bird species are afforded some protection under the Migratory Bird Treaty Act.

Waterbirds

During migration periods, more than 300,000 cranes and 20,000 geese, ducks, and swans pass through the Fort Greely/Delta area. The wetlands complexes, ponds and lakes of TFTA and YTA may provide important staging sites for some migrating waterbirds.

There are considerable fluctuations in both adult and cygnet counts among years, but the long-term trend (1978-1997) is clearly toward increases in both adults and cygnets, consistent with interior Alaska as a whole. The 1998-2002 INRMP summarized this trend.

2.3.3.3 Fish

The Chena and Salcha rivers are important spawning areas for chum salmon, arctic grayling and king salmon. All of these species inhabit the Tanana River seasonally. A list of verified fish species is in Appendix F.

Fewer species are found in the Tanana River, due to its higher silt load (Nakata Planning Group 1987). Salchaket Slough and Bear, McDonald, and Clear creeks have the best potential fish habitats in the Tanana Flats drainage.

River Road Pond (formerly Sage Hill Pond), Monterey Pond, Weigh Station 1, Weigh Station 2, and Manchu Lake are stocked with fish by ADF&G.

2.3.3.4 Reptiles and Amphibians

Wood frogs (*Rana sylvestris*) are the only amphibians on Fort Wainwright. There are no reptiles.

2.3.3.5 Special Status Fauna

No federally-listed threatened or endangered animals are resident on Fort Wainwright.

The U.S. Fish and Wildlife Service, Office of Migratory Bird Management maintains a list of *Migratory Nongame Birds of Management Concern in the United States*. Species listed for Alaska that may occur on Fort Wainwright are trumpeter swan, common loon, northern harrier, northern goshawk, olive-sided flycatcher, alder flycatcher, gray-cheeked thrush, and blackpoll warbler.

Eighteen species confirmed on Fort Wainwright are included on the Boreal Partners in Flight Working Group as target or priority species for monitoring because of declines in populations noted across the Americas. There are no legal requirements to manage these species, although all migratory bird species are afforded some protection under the Migratory Bird Treaty Act (Ruth Gronquist. BLM, personal comm.).

2.3.4 Special Interest Management Areas

Fort Wainwright has several areas with special natural features. They harbor sensitive or unique wildlife species or represent unique plant communities. The following are special area categories with their accompanying restrictions. Most areas either have been or soon will be digitized in the GIS, and maps showing restricted areas will be available to project planners. Figure 2-11 shows special interest areas.

2.3.4.1 Sage Hill Special Interest Area

Sage Hill overlooks a wetlands (Sage Hill pond) in the Main Post area. This is a Watchable Wildlife area with a planned viewing platform and signage. In addition, south-facing bluffs in this area have ecological significance due to the unique steppe vegetation communities found here. This scenic site has been damaged by gravel removal. No further gravel removal will be allowed.

2.3.4.2 Granite Tors Special Interest Areas

The Granite Tors rock outcrops along the eastern portion of YTA likely have cultural significance. USARAK has imposed restrictions on development, ground disturbance, and vegetation removal in the Granite Tors to protect any cultural resources.

2.3.4.3 Wood River and Clear Creek Buttes

Buttes near Blair Lakes and along the Wood River have cultural and ecological significance. Many of these buttes have cleared helicopter pads for military training, especially since they are on high, relatively dry ground. These buttes will be placed off-limits to ground and vegetation-disturbing activities with exception of existing helicopter pads. This restriction should not impact military training since most missions on buttes require vegetative cover for concealment.

2.3.4.4 Moose Calving Areas on Tanana Flats

ADF&G have identified six parcels on TFTA as important moose calving areas from 15 May through 30 June annually. The Army has agreed with ADF&G (U.S. Army 1986) to conduct operations in such a manner that will not adversely affect calving in these parcels between 15 May to 30 June. Since virtually no training occurs on TFTA during warm months, moose calving has not been hindered by the military.

Fort Wainwright has an active cultural resources program.

2.3.4.5 Moist Tundra Special Interest Areas

Moist tundra is one of the most easily damaged ecosystems on Fort Wainwright, especially during warm weather. On Fort Wainwright, moist tundra occurs above treeline on tops of hills, 2,500-3,000 feet above sea level. The Army provides protection for fragile moist tundra by requiring it be frozen prior to military training. In addition, snow is pushed rather than plowed to bare ground, when creating winter trails for military access. This prevents most damage to the protective vegetation mat.

2.4 Cultural Resources

"... there is probably a more adequate representation of cultural resources on Fort Wainwright than for many other areas of the state." [8]

Less than 2% of Fort Wainwright has been surveyed for archeological sites, and 70 sites have already been found. Three districts (which include 47 sites) and one other site have been determined to be eligible for inclusion in the National Register of Historic Places by the Army and the State Historic Preservation Office (SHPO). All Main Post buildings have been inventoried. One National Historic Landmark, Ladd Field (now called Wainwright Army Airfield), has been formally designated as eligible for inclusion in the National Register.

[8] Bacon et.al. 1986

Only eight prehistoric and no historic sites have been found on YTA (included in above totals). Only one site is eligible for the National Register (BLM and U.S. Army 1994).

In 1986, the Sixth Infantry Division (Light) completed a Historic Preservation Plan for U.S. Army lands in Alaska, including Fort Wainwright (Bacon et al. 1986). This plan was never signed, but contains a summary of information pertaining to Fort Wainwright cultural resources known at the time. The remainder of this section is condensed from this document, unless referenced otherwise.

Surveys have been generally very site specific, often required for planned construction projects. Most sites have been found in the lowland spruce/hardwood vegetation community. Only a relatively small portion of Fort Wainwright has high sensitivity with regard to cultural resources, including the Main Post area, Blair Lakes Bombing Range and Maneuver Area portions of TFTA, and Manchu Drop Zone. These are the highest priorities for survey. The rest of the installation is low to moderate in sensitivity.

The Fort Wainwright area has probably supported human populations for 10,000 to 12,000 years. Interior Alaska contains the oldest verifiable prehistoric remains in the state since the Interior was ice-free during the Wisconsin glaciation.

The Athabaskan original homeland was in the Tanana Valley. The Tanana Indians, a branch of the Northern Athabaskans, lived there. The Tanana were a highly mobile group at the time of European contact, moving to fish camps in summer, and various hunting and trapping camps during other seasons. Several village sites are reported near Wood River Buttes, just northwest of the fort's boundary and near Fairbanks, but they have not been located. The White Mountains and Tanana Hills (YTA) were used sporadically during the past several thousand years for hunting but likely not for year-round settlements.

Indirect European contact began in the 1830s and 1840s, and direct trade began in the 1860s. During the 1860s, prospectors and explorers penetrated Tanana territory, and the discovery of gold in 1902 created the great influx of white settlers. Shortly thereafter, the traditional way of life of the Tananas was a thing of the past.

Figure 2-11. Fort Wainwright Special Interest Areas.

See FWA INRMP Maps\FWA INRMP FIG02-11.PDF.